TITLE OF THE INVENTION

IMAGE PICKUP APPARATUS AND INFORMATION PROCESSING

METHOD IN THE IMAGE PICKUP APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

5   This application is based upon and claims the

benefit of priority from prior Japanese Patent

Application No. 2003-188491, filed June 30, 2003, the

entire contents of which are incorporated herein by

reference.

10   BACKGROUND OF THE INVENTION

1.   Field of the Invention

The present invention relates to an image pickup

apparatus such as a network camera and more

particularly to an image pickup apparatus in which

15   information of photographed images is stored in storage

sections of other image pickup apparatuses on network

dispersedly and information processing method for the

same image pickup apparatus.

2.   Description of the Related Art

20   Recently, with prevailing of network system for

digital devices, monitor image systems through the

network have been developed and manufactured for

monitor system using TV camera.   In such a monitor

image system, plural TV cameras are connected to each

25   other and pieces of image information are stored in its

storage section appropriately.

According to a prior art (Jpn. Pat. Appln. KOKAI

Publication No. 2001-339710), there is provided a monitor image selection control system which includes plural TV cameras and plural display units and displays a monitor screen selectively.

5   However, the above-described conventional technology has a problem about the monitor image selecting control system, about how the image information should be dispersed in single image pickup apparatuses each having a recording memory or the like,

10   such as a network camera, which is a problem which the present invention intends to solve. That is, if a recording memory region for storing an alarm image inside the network camera becomes short, a previously stored image is overwritten or cleared to store that

15   new image, and therefore, a network administrator becomes unable to see previous alarm images, which is a problem to be solved by the present invention. In case where a system constituted of plural network camera each having a memory section is constructed on network,

20   how recording memories inside other image pickup apparatuses, which are resources not employed yet on the network, should be employed to solve the shortage of the recording memory region is a problem to be solved.

25   BRIEF SUMMARY OF THE INVENTION
       According to an aspect of the present invention, there is provided an image pickup apparatus comprising:

an image pickup section which photographs an image and outputs its image information, a recording section which stores the image information from the image pickup section, a communicating section which transmits the image information from the image pickup section to an external unit, a determining section which determines which the image information from the image pickup section is stored in the recording section or stored in the external unit through the communicating section as a dispersion processing and a control section which, when the determining section determines that the image information should be stored in the external unit, transmits a request signal for the dispersion processing to the external unit through the communicating section and if an acceptance signal about the dispersion processing is received from the external unit, have the image information transmitted to the external unit.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. 1 is a block diagram showing an embodiment of the structure of the image pickup apparatus according to this embodiment;

FIG. 2 is an explanatory diagram showing an example of a connecting method for connecting the image pickup apparatus of the present invention to a network;

FIG. 3 is a sectional view showing an embodiment of the structure of the image pickup apparatus

according to the present invention;

FIG. 4 is a flow chart showing an example of dispersion processing on the transmission side of the image pickup apparatus of the present invention;

FIG. 5 is a flow chart showing an example of dispersion processing on the reception side of the image pickup apparatus of the present invention;

FIG. 6 is a flow chart showing an example of collection processing on the transmission side of the image pickup apparatus of the present invention; and

FIG. 7 is a flow chart showing an example of collection processing on the reception side of the image pickup apparatus of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, the network camera, which is an image pickup apparatus of the present invention will be described in detail with reference to the accompanying drawings.

<Network camera which is an image pickup apparatus of the present invention>

(Configuration)

The image pickup apparatus and image pickup system of the present invention will be described by taking a network camera and a personal computer (PC) connected to the same network as an example, with reference to the accompanying drawings. FIG. 1 is a block diagram showing an embodiment of the structure of the image

pickup apparatus according to the present invention. FIG. 2 is an explanatory diagram showing an example of a connecting method for connecting the image pickup apparatus of the present invention to the network.

5   FIG. 3 is a sectional view showing an embodiment of the structure of the image pickup apparatus of the present invention.

As shown in FIG. 1, a network camera unit 10 which is an image pickup apparatus of the present invention

10   comprises an objective lens 11, a mechanical iris mechanism 12 which receives incident light passing the objective lens 11, receives a control signal corresponding to a predetermined exposure value and corrects exposure mechanically corresponding to the

15   same control signal and a solid image pickup apparatus 13 such as charge coupled device (CCD) which receives incident light subjected to the exposure correction and outputs a detection signal corresponding thereto. Further, this solid image pickup apparatus 13 receives

20   a control signal for controlling conversion processing timing for converting the detection signal corresponding to incident light from a timing generator 15 so as to carry out the conversion processing. The exposure correction is enabled by corresponding to a

25   timing given by this control signal also. Further, the detection signal from the solid image pickup apparatus 13 is supplied to an A/D converter auto gain controller

(AGC) which executes gain control and converted to digital signals and further, converted to an appropriate value corresponding to the control signal from the timing generator 15 and outputted.

5   The network camera unit 10 further includes an image processing section 16 which receives an output from the A/D converter AGC circuit 14 and an image compression section 17 which carries out compression processing such as MPEG compression, JPEG compression
10   upon the image signal subjected to the image processing. The image processing section 16 executes such image processing on the inputted image signal as sharpness processing, contrast processing, gamma correction, white balance processing, pixel addition
15   processing.

The network camera unit 10 further includes a main processing unit (MPU) 20 which controls entire processing action so as to control the dispersion processing/collection processing which is a feature of
20   the present invention described later, a memory 21 which stores a program for controlling these actions and provides a work area for respective processing actions for the image signal and a recording memory 28 which stores photographed image information and alarm
25   video to be recorded upon detecting a motion.

Further, the network camera unit 10 is connected to the MPU 20 through data bus and has an Ethernet

communication section 18 and a radio local area network (LAN) communication section 19, so that it executes communication processing with an external PC 26, other image pickup apparatus 10 or the like through wire

5   network N or wireless network.

The network camera unit 10 further includes a pan driver 22 which is connected to the MPU 20 through data bus and controlled so as to drive the camera unit C in a pan direction, a pan motor 24 such as a stepping

10   motor, a tilt driver 23 for driving the camera unit C in a tilt direction and a tilt motor 25 such as a stepping motor. Here, the camera unit has at least, the aforementioned objective lens C, the mechanical iris mechanism 12 and the solid image pickup

15   apparatus 13.

Plural units of the network camera units 10 can be provided through a network N as shown in FIG. 2. Further, the network camera unit 10 can be driven in the pan direction and tilt direction by means of

20   the PC 26 or the like through the network N and image signals picked by the network camera unit 10 can be monitored, recorded and reproduced. Further, a pointing device 27 such as a mouse is connected to the PC 26.

25   As shown in FIG. 3, the network camera unit 10 contains the camera unit C, a pan motor 24 for driving the camera unit C in the pan direction, a tilt motor 25

for driving it in the tilt direction and an electrical
mounting section 10-1 having the structure shown in
FIG. 1.

(Basic operation)

The network camera unit 10 having such a structure
executes the basic operation which will be described
below. That is, the network camera unit 10 executes
image pickup operation of receiving incident light from
a photographing object and supplying an image signal
corresponding to the image pickup screen through
a network, camera drive operation for driving the
camera unit C, for example, in the pan direction and
tilt direction, various kinds of modes based on
photographed image signal (for example, motion
detecting action), various kinds of setting actions for
setting the exposure correction method, which will be
described later, self-test operation and the like.

That is, the image pickup operation is carried out
by receiving an instruction signal from the PC 26 or
the like, which is a control unit through the network N
(or radio network) according to an operation program
stored in the memory 21 under a control of the MPU 20.
The solid image pickup apparatus 13 which receives
incident light from a photographing object through the
objective lens 11 supplies a detection signal
corresponding to this to the A/D converter circuit AGC
circuit 14.

The exposure correction is executed under, for example, controls of the mechanical iris mechanism 12, the solid image pickup apparatus 13 and the AGC circuit 14. That is, the mechanical iris mechanism 12 receives an exposure control signal from the MPU 20 and controls the quantity of light to be picked up so as to execute a desired exposure correction. In the solid image pickup apparatus 13, its shutter speed is corrected as its electronic shutter function and an exposure control signal is received from the MPU 20 so as to supply a timing signal from the timing generator 15 correspondingly. The solid image pickup apparatus 13 executes conversion processing of converting incident light to a detection signal corresponding to the timing of a timing signal so as to adjust the shutter speed. Consequently, the exposure adjustment is performed.

The AGC circuit 14 is supplied with a control signal from the timing generator 15 which receives an exposure control signal from the MPU 20 and correspondingly, controls the gain of a detection signal supplied from the solid image pickup apparatus 13 so as to correct the exposure. Although three-stage exposure correction has been picked up as an example here, the exposure correction can be performed based on any one of them and further can be performed by pixel addition processing in the image processing section 16

or the like.

After zero coordinate adjustment is performed by the pan motor 24 and tilt motor 25, which are stepping motors in the camera driving operation, the MPU 20
5   always sees the current direction of the camera unit C. The MPU 20 always controls the coordinates of a screen photographed by a current camera unit C and the camera unit C is driven in the pan direction or tilt direction corresponding to an operation control signal supplied
10   from the MPU 20 to the driver, so that a photographed screen is changed and at the same time, the MPU 20 always recognizes current coordinates of the photographed screen. Thus, user can move the camera unit C in the pan direction or tilt direction while
15   watching a photographed screen corresponding to an image signal supplied from the current image pickup apparatus 10, displayed on the PC 26 connected through network and see the photographed screen depending on a move. The MPU 20 recognizes and controls the
20   coordinates of the current photographed screen and user can obtain coordinate information of the current photographed screen on, for example, PC 26, corresponding to his operation.

Under each operation mode, for example, the motion
25   detecting operation mode, the image pickup apparatus 10 automatically detects the motion of an image in an arbitrary region set by user. If an observation region

for detecting the motion in the photographing screen is set corresponding to user's operation in the motion detecting operation mode setting screen and if a change of the photographing screen over a predetermined value is detected in that observation region, the MPU 20 determined that the motion is detected, and for example, stores the image information in this period in the recording memory 28 as an alarm image successively, which is preferable.

(Dispersion processing of the image pickup apparatus of the present invention)

The dispersion processing of image information in the image pickup apparatus of the present invention will be described in detail with reference to a flow chart. FIG. 4 is a flow chart showing an example of the dispersion processing on the transmission side of the image pickup apparatus of the present invention. FIG. 5 is a flow chart showing an example of the dispersion processing on the reception side of the image pickup apparatus of the present invention.

In the image pickup apparatus of the present invention, as indicated in the flow chart of FIG. 4, first, a detection signal from the solid image pickup apparatus 13 through the objective lens 11 and mechanical iris mechanism 12, which are image pickup section, is supplied to the A/D converter AGC circuit 14, which performs gain control, and converted to

digital signal. Further, this digital signal is converted to an appropriate value corresponding to a control signal from the timing generator 15 and undergoes image processing in the image processing

5 section 16 and after that, the image is compressed and transmitted to the external PC 26 or the like through the Ethernet communicating section 18 and radio LAN communicating section 19. However, depending the specification, the digital signal from the A/D

10 converter AGC circuit 14 is recorded in the recording memory 28 just as it is, or after it undergoes image processing in the image processing section 16 or after the image is compressed by the image compression section 17.

15   That is, the picked up image information is not only transmitted directly through the communicating section, but also recorded in the recording memory 28 appropriately depending on the specification. All the image information may be recorded in the recording

20 memory 28 temporarily or only when the motion detection set by the motion detecting operation mode is activated, the image information may be recorded in the recording memory 28 in detail.

     If recording processing is carried out in the

25 recording memory 28 corresponding to the specification, memory shortage may occur in the recording memory section 28 (S11). At this time, if the MPU 20 having

the function of the dispersion (collection) processing
determining section control section detects that a
method for recording image information which should be
recorded by overwriting on the oldest image information
in the recording memory 28 is set up as initial setting
by user (S12), it determines that it should overwrite
without executing the dispersion processing of the
present invention and then controls for overwrite.

However, if the MPU 20 detects a setting for
executing the dispersion processing when memory
shortage occurs, which is set up as the initial setting
(S12), it transmits a dispersion request signal for
requesting other image pickup apparatus 10 on the
network for the dispersion processing through the
communicating sections 18, 19 (S13). When it receives
a dispersion acceptance signal saying that the
dispersion processing is accepted from a mating image
pickup apparatus 10 (S14), the image information is
transmitted to the mating image pickup apparatus 10.

At this time, preferably, the MPU 20 generates,
for example, file ID (identification information),
dispersion mode signal (information an object of the
dispersion processing) and transmission destination
camera ID (identification information) for the header
of the image information and then attaches them to the
header before transmission (S15).

The MPU 20 generates list information as the

history information which underwent the dispersion

processing and stores this in the memory region such as

the recording memory section 28 and memory 21 (S16).

Consequently, the collection processing which will be

5   described later enables image information dispersed on

other image pickup apparatus 10 to be collected easily.

Next, a processing after the dispersion request

signal is received by the mating image pickup apparatus

10 for the dispersion processing will be described with

10   reference to a flow chart of FIG. 5.   Although the

image pickup apparatus 10 on the reception side has the

same structure and function as the image pickup

apparatus 10 of the transmission side, it does not

always need to have the same function but it may

15   contain a higher function as the image pickup

apparatus 10.

In the image pickup apparatus 10 on the reception

side, if the MPU 20 receives a dispersion request

signal from the image pickup apparatus 10 on the

20   transmission side (S21), the image pickup apparatus 10

on the reception side determines whether or not there

is an empty region in the recording memory 28 or the

like (S22).   It is preferable to add a determination

about whether or not the dispersion processing is

25   accepted as the initial setting to this determination.

The MPU 20 accepts the dispersion processing and if it

is determined that there is an empty region in the

recording memory 28 or the like, it transmits a
dispersion acceptance signal saying that the dispersion
processing is accepted through the communicating
sections 18, 19.

5   Correspondingly, image information having the
header is transmitted from the image pickup apparatus
10 on the transmission side to the image pickup
apparatus 10 on the reception side after a
determination indicated in step S14 of the flow chart

10   shown in FIG. 4. If this is received by the image
pickup apparatus 10 on the reception side (S24), the
received image information is stored in the recording
memory 28 and the like (S25).

       Consequently, the image pickup apparatus 10 of the

15   present invention is capable of recording image
information which should be recorded by making the best
use of the recording function of the other image pickup
apparatus on the network.
(Collection processing in the image pickup apparatus of

20   the present invention)

       Next, the collection processing which is a post
processing of the dispersion processing for the image
information in the image pickup apparatus of the
present invention will be described in detail with

25   reference to a flow chart. FIG. 6 is a flow chart
showing an example of the collection processing on the
transmission side of the image pickup apparatus of the

present invention. FIG. 7 is a flow chart showing an example of the collection processing on the reception side of the image pickup apparatus of the present invention.

5   Unless the collection processing for dispersed image information is carried out after the dispersion processing of the image information, the stored image information cannot be used. That is, if a readout request signal or the like for urging the image

10   information recorded as monitor image to be transmitted is transmitted from the PC 26 on the network in FIG. 6, the image pickup apparatus 10 on the transmission side begins the collection processing (S31).

That is, the MPU 20 reads out the aforementioned

15   list information stored in the recording memory 28 or the like so as to determine whether or not there exists image information which is requested to be read out in the PC 26 by using identification information such as the file ID (S32). Unless there exists any image

20   information requested to be read out which undergoes the dispersion processing, the image information requested to be read out is read out from the recording memory 28 of the image pickup apparatus 10 on the transmission side (S35). Then, this read out image

25   information is supplied to the PC 26 on the network N through the communicating sections 18, 19 (S36).

The MPU 20 reads out the aforementioned list

information stored in the recording memory 28 or the like and if it is determined that there exists the image information which is requested to be read out by the PC 26 in the list (S32), the MPU 20 creates a

5   collection request signal which requests collection of the image information corresponding to the camera ID (identification information of the image pickup apparatus) corresponding to the file ID of the image information requested to be read out and transmits it

10   to the image pickup apparatus 10 on an appropriate network through the communicating section (S33). Then, the image information transmitted corresponding to this collection request signal is collected and this image information is supplied to the external PC 26 or the

15   like which requests the read-out (S34). Meanwhile if part of the image information which should be supplied exists on the image pickup apparatus 10 on the transmission side and the image pickup apparatus 10 on the external reception side, image information pieces

20   read out from each place are synthesized and then supplied to the external PC 26 or the like.

On the other hand, the collection processing of the image pickup apparatus 10 on the reception side on a dispersion destination will be described in detail.

25   If the MPU 20 which is the image pickup apparatus 10 on the reception side receives a collection request signal which is a collection request signal for the image

information (S41), the image information corresponding to the file ID indicated by the collection request signal is read out from the recording memory 28 (S42). Then, the read out image information is transmitted to the image pickup apparatus 10 on the transmission side through the communicating sections 18, 19 (S43). If the read out image information is deleted from the recording memory 28 and if it is set up in the initial setting (S44), the MPU 20 deletes the read out image information from the recording memory 28 (S45). Consequently, the memory capacity of the recording memory in the image pickup apparatus 10 on the reception side is recovered quickly after the dispersion processing and collection processing are carried out.

As described above, in the image pickup apparatus of the present invention, if photographed image information and alarm image provided by alarm detection and the like cannot be stored in the recording memory 28 any more, an empty capacity of the recording memory in the image pickup apparatus 10 or the like on the network is automatically detected and the image information which cannot be automatically recorded is subjected to the dispersion processing. If an image information readout request is dispatched from the PC 26 on the network for control, user can read out necessary image information from the image pickup

apparatus 10 only by ordinary read-out operation without being conscious of anything.

In the above description, the dispersion processing and collection processing are carried out by generating and using the list information and header information by an activation of the dispersion processing section control section of the MPU 20. However, if both of them are not always necessary, it is permissible to execute the dispersion processing and the collection processing by only the list information or header information. The above-described dispersion processing and collection processing are just an example, but they can be executed according to other method and the present invention can be extended to a wide range not departing from the disclosed principle and novel feature.

For example, preferably, the image pickup apparatus on the transmission side always registers image pickup apparatuses located on the network and monitors the remaining capacity of the recording memory every predetermined time interval for the dispersion processing and collection processing. Consequently, if the capacity of the recording memory of a self unit becomes short, an image pickup apparatus (image pickup apparatus having the largest empty capacity) most suitable for dispersion is specified immediately, so that the dispersion processing can be carried out.

The PC 26 which has been explained as a control unit on the network may be a digital image recorder having the same function or can execute not only image pickup operation but also recording and reproducing of photographed images.

Those skilled in the art can achieve the present invention through the above-described various embodiments. Further, those skilled in the art can find out various kinds of modifications easily and the present invention can be applied to various embodiments without any special inventive ability. Therefore, the present invention is extended to a wide range not contradicting the disclosed principle and novel feature and is not restricted to the above-described embodiments.

As described above, according to the present invention, there is provided an image pickup apparatus and information processing method for such an image pickup apparatus in which image information which cannot be recorded in a recording memory of its main unit any more is automatically dispersed to other image pickup apparatuses on network without any user's operation, so that the dispersed image information can be collected and read out easily corresponding to user's ordinary read-out operation.